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CHICHA, A NATIVE SOUTH AMERICAN BEER

BY

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SIMPLE FERMENTED beverages enlivened the ceremonies of most Indian groups in the Americas long before the Conquest. These mildly alcoholic brews were so common in some regions that they may be regarded as furnishing substantial contributions to the diet. Even today this is true of Central Mexico, where pulque, made from the sap of the maguey plant, is the national drink; and of much of Bolivia and Peru, where enormous quantities of maize chicha are consumed.

When discussing chicha it is necessary to specify the type, for the word "chicha" was spread by the Spaniards so that it is now used to designate both alcoholic and non-alcoholic beverages made from a wide variety of plants and prepared in diverse fashions. Many of these are listed by La Barre (1938). In a relatively simple community of the civilized Takana Indians near Rurrenabaque in the Bolivian lowlands, intoxicating chicha is prepared from mandioca (*Manihot esculenta* Crantz,

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called *e mi he*³ in Takana), from ripe plantains (*na sa puri*), from fruits of the wine palm (*bi*, a species of *Mauritia*), from flour corn (*di he dure*), and from flint corn (*di he tada*). There are also non-alcoholic chichas made from toasted corn flour or from ground toasted peanuts, the latter probably having been introduced into Rurrenabaque from the southeast.

In the highlands and valleys of Bolivia there are two non-alcoholic beverages called chicha. *Chicha de quinoa*, or *aloja*, is usually merely water in which quinoa (*Chenopodium Quinoa* Willd.) has been boiled. Sometimes sugar and cinnamon are added. For *chicha de maní*, or *tecti* in the Aymara language, peanuts are toasted and ground, then toasted again to remove the oil. Whenever peanut chicha is to be made some peanut paste and sugar are stirred into quinoa chicha and peanut oil is poured over the surface. Sweetened drinks made of toasted and ground maize or barley are usually called *tostado*, although they are occasionally called chicha.

A simple alcoholic chicha can be made by mixing a substance containing starch or sugar with water and allowing the liquid to ferment. However, very little chicha is prepared in this way. Most chicha is made by methods which increase the alcoholic content and improve the flavor, the increase in alcoholic content being brought about by converting some of the starches to sugars which are more readily available for fermentation. An enzyme, diastase, will bring about this change, and in South America the most common source of diastase for chicha-making is saliva. The custom of masticating roots, fruits and grains in the preparation of beverages is widespread. Explorers have found chicha made in this fashion among

³ Native words are spelled in the fashion of the literate population of the area in which they occur. Pronunciation and accent follow the usual rules for Spanish.

the most primitive as well as among some of the more advanced tribes. The raw materials chewed for fermented beverages have been reported to be mandioca in lowland Ecuador (Flornoy, 1945); mandioca and maize in central Brazil (Roquette-Pinto, 1938); maize and sweet potatoes in coastal Brazil (Métraux and Nimuendajú, 1946); algarroba (*Prosopis* spp.), tusca (*Acacia aroma* Gill.) and chanar fruits (*Gourlieia spinosa* (Mol.) Skeels) in the Chaco of Bolivia, Paraguay and Argentina near the Pilcomayo River (Métraux, 1946); and maize in the highlands of Peru (Zárate, 1853).

Malting (soaking grain in water and then allowing it to germinate) is another method of introducing diastase. Garcilaso de la Vega⁴ (1800), José de Acosta (1940), Bernabé Cobo (1890-1893) and Hipólito Ruíz (1931) briefly mention malting. The early writers did not give detailed information on native foods and were generally scornful of indigenous customs. They left no complete account of chicha-making. It is probable, however, that malting is a pre-Columbian development.

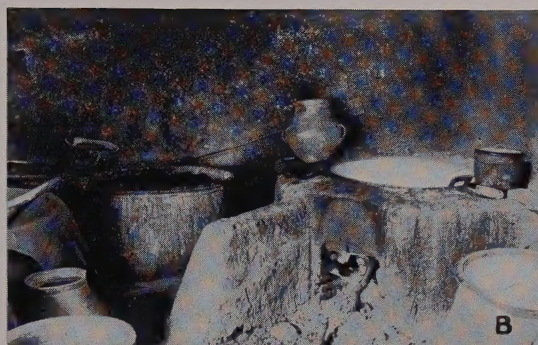
Malting is common in most of Bolivia and Peru, especially in the highlands, but it is not common in other regions. It is probable that maize and quinoa were first domesticated in Bolivia and Peru, and mandioca in east-central Brazil. The roots of mandioca could not be malted, but they are very well suited to mastication. Where seed crops had been cultivated for a long time there would have been ample opportunity to develop malting and still continue the chewing methods which had been found to be adapted to the pods of algarroba and similar uncultivated raw materials.

⁴The dates given are those of the editions consulted, and are not the dates when written, nor necessarily the dates of the respective first editions. The references to Acosta and Cobo were suggested by Dr. John Rowe.

EXPLANATION OF THE ILLUSTRATION

PLATE IV. A. Salivated corn flour or *muko*. (Left) from *culli* maize; (right) from *huilcaparu*. B. Interior of a chicha-making establishment in Punata, Bolivia. The steaming pan over the fire is the *perol*. The large containers are *wirkis*, for the temporary storage of chicha materials while being processed. C. Salivating maize flour or *mukeando*. Punata, Bolivia. D. *Cantaros* in which chicha is placed near the end of the process. The chicha is sold directly from these jars. Cochabamba.

PLATE IV



The authors have studied chicha-making in Bolivia at Tiquipaya, Quillacollo, Punata, Sacaba and Cochabamba among the Quecha-white population. We were able to secure little information of value from the civilized Chiquitano Indians of Santiago de Chiquitos, but from other lowland groups, particularly the Reyesanos near Reyes and the Takanas between Reyes and Tumapasa, we secured quite complete data. The literature on the subject was of very little help except to confirm our observation that chicha-making is an old art, widespread in South America.

CHICHA-MAKING IN THE COCHABAMBA VALLEY

Because the chicha-making methods in use in the Cochabamba Valley, located at an altitude of more than eight thousand feet in the Bolivian highlands, are the most complex, and because they are undergoing changes, they will be considered in greater detail than the methods employed by the lowland Indians.

The valleys of Bolivia are separated by high mountain ranges, and inter-valley commerce was long restricted by both physiographic and ethnic barriers. The consequent existence of many small centers of cultivated plant populations which had only an occasional interchange of plant material constitutes an ideal situation for the rapid evolution of numerous forms of plants. In the Cochabamba Valley, for example, there are many varieties of maize, some with highly specialized uses (Cutler, 1946).

Raw Materials

In Cochabamba, chicha is prepared from maize. The berries of molle (*Schinus Molle* L.) and the chewed pods of algarroba are no longer utilized. At slightly higher elevations an alcoholic chicha is sometimes made from malted quinoa grains.

The most highly preferred maize for chicha is *chuspillo*, a many-rowed sweet corn. Most of this sweet corn is grown on the larger haciendas for use only as toasted grains, or for the preparation of an especially strong chicha.

The next choice for chicha is *culli*, a cherry-red to almost black maize which contains large amounts of water-soluble anthocyanins. Usually the purple cobs are ground and added to the corn flour. Chicha made from *culli* is a rich Burgundy color. Occasionally the fruits of one of the various *Opuntias* called *airampu* (*Opuntia sulphurea* G. Don in the Cochabamba district (Pl. IVc), *O. Soehrensii* Britt. & Rose near La Paz, and an undescribed species from near Arani) are added to chicha to give it this desired color. The young inflorescences of a purple amaranth are also said to be used to dye chicha.

Uchukilla, a maize with small ears closely resembling *culli* except that it is white, is the third choice for chicha-making in the Cochabamba Valley. Very similar small orange flint ears grown at altitudes of about 2,700 meters are used for chicha in Totora, in the Department of Cochabamba. The chicha made from this maize is one of the best.

Another preferred source of chicha is *paltal hualtacu*, also somewhat like *uchukilla* but with larger ears, yellow flint endosperm and an occasional slight tinge of blue in the aleurone.

Notwithstanding the fact that chicha made from any of the five types of maize already referred to is of superior quality, the most common source of the beverage in the Cochabamba Valley is *huilcaparu* the maize most frequently grown. This has a rust-red cob with fourteen to eighteen rows of dented grains. The denting varies from small dimples to as much as is found in the most extreme of North American dents. The endosperm is yellow and

the aleurone is a deeper blue than that of *paltal hualtacu*. This combination makes the grains appear brownish, with a silvery sheen produced by minute air spaces under the pericarp.

Forbes (1870, p. 249) says, "In some parts a fermented drink is made by the Indians from the sweet stalk of the young green Indian corn, called "huiru" (wiru): this is the name of the stalk." Although sweet young stalks, usually of *culli* or *uchukilla*, are sold today in the markets to be chewed like sugar cane, they are not used in chicha-making.

Preliminary Steps

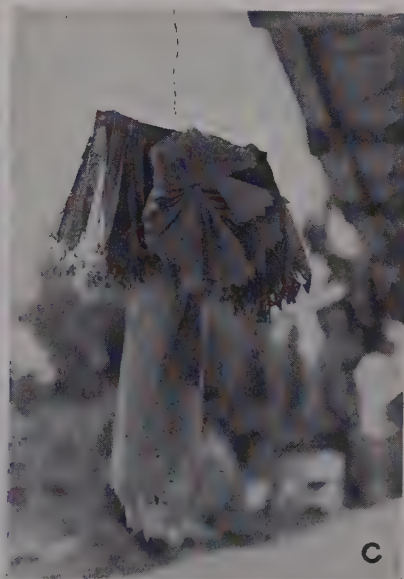
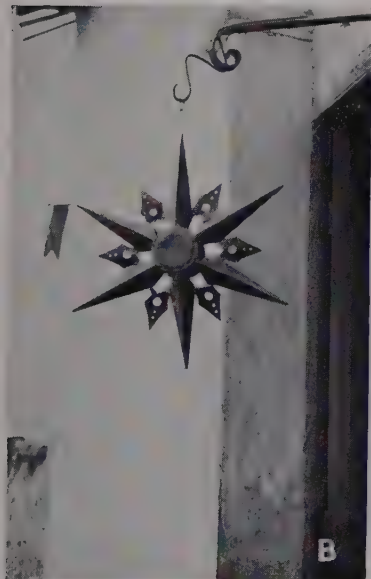
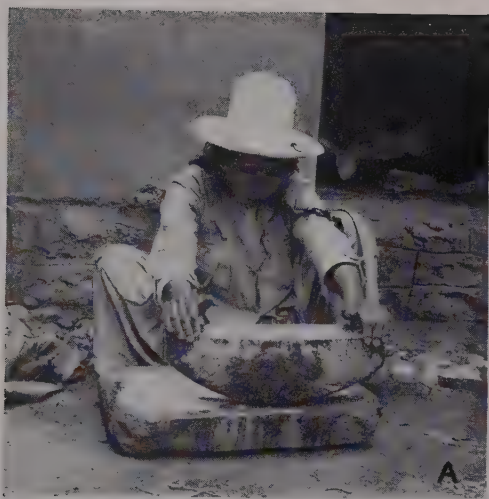
The maize grains are usually ground by hand, often with a half-moon-shaped stone rocker (*maran uña*) on a flat stone (*maran*) as has been done for centuries. The flour is then mixed with saliva. On some of the larger haciendas it is still the custom to have women and children gather in groups to do this (Pl. IVc). The flour is moistened very slightly with water, rolled into a ball of convenient size and popped into the mouth. It is thoroughly worked with the tongue until well mixed with saliva, after which it is pressed against the roof of the mouth to form a single mass, then shoved forward with the tongue and removed with the fingers. The teeth play very little part in the process. For this reason we prefer the term "salivation," and use the word "mastication" only when referring to cases where it is necessary for the teeth to macerate the raw materials, as is done when algarroba, mandioca or sweet potatoes are used.

The salivated morsels are dried in the sun and sacked for storage and shipment. They roughly resemble sets of false upper teeth (Pl. IV_A). Since *muko*, as the salivated flour is called, commands a much higher price than unsalivated flour, property owners try to convert as much flour as possible into *muko*.

EXPLANATION OF THE ILLUSTRATION

PLATE V. A. Grinding corn flour, Punata, Bolivia.
B. Chicha sign near Cochabamba. C. Chicha sign
in Tiquipaya.

PLATE V



In some places in the Cochabamba Valley maize is malted. In Tiquipaya this is done by soaking the grains overnight in a pottery jar with enough water to cover them. The next day the grains are spread to a depth of about four inches on some leaves, and covered with several blankets. The germinating seedlings generate considerable heat. The temperature in one such bed was 34°C. When the shoots are nearly as long as the grains they are placed in the sun to dry. In Tiquipaya, and also in Cuzco, Peru, it is a common sight to see these sprouted grains spread out on bright colored blankets in the dusty streets. When dry, the malted grains are ground. Both the germinating grain and the flour prepared from it are called *huiñapu*.

Brewing

The First Day

A wide-mouthed earthen pot (*wirki*) is filled about one third full with dried and ground malted grains (*huiñapu*) or salivated flour (*muko*). When *muko* is used, unsalivated maize flour is often mixed with it. Crude sugar (*chancaca*), or the pulp of a squash (*Cucurbita ficifolia* Bouché) known as *layacote*, is occasionally added. The pot, which is about thirty inches high and thirty-four inches in diameter, is filled with water heated to about 75°C. Boiling water is not used as it is said to produce an undesirable pasty consistency. After being well mixed for nearly an hour the mixture is allowed to settle and cool further. Three layers can then be distinguished: a liquid (*upi*) above; an almost jelly-like layer in the middle; and coarser particles (*hanchi*) below. The cloudy liquid *upi* is scooped up with a gourd (either *Crescentia Cujete* L., known in the Quecha language as *tutuma*; or *Lagenaria siceraria* (Mol.) Standl., known as *mate*) and placed in another large-mouthed pot and allowed to

stand. The middle layer is transferred to a large shallow pan (*perol*) permanently installed on a clay support over a fire (Pl. IVB). During the last few hours of the day this second layer simmers and concentrates. To the *hanchi* may be added more *muko* or some roughly broken corn (*tiki*) and more hot water. Rarely quinoa is added instead of the *tiki*. This mixture is agitated again, allowed to settle, and the liquid portion is then added to the original *upi*.

The Second Day

The *upi* continues to stand. The fire under the *perol* is rebuilt and the mixture is allowed to simmer for several hours longer until it becomes caramel-like in color and flavor. This product, called *misqui kketa*, is transferred to a *wirki* and allowed to cool. Most of the by-products of chicha-making are no longer important since their place has been taken by sweets which are more easily made with sugar. A small amount of the *misqui kketa* may be eaten in the home where the chicha is being prepared, but nearly all of it is used in the chicha itself. It is probable that the *misqui kketa* was originally used solely as a sweet and was not added to the chicha. Chichamakers, like alchemists of old, surround their art with an aura of mystery, and probably emphasize some of their steps in such a way as to confound inquisitive consumers.

The *hanchi* left in the bottom of the original open-mouthed *wirki* is drained of its remaining moisture in the following manner: A cylinder woven of splints is pressed vertically into the layer of *hanchi*. The particles inside the cylinder are removed and packed about the periphery. The last remnant of liquid filters through the woven cylinder. This is a sweet, clear, non-alcoholic liquid called *chua conchu* which may be drunk in the

house where the chicha is made, but, more commonly, is added to the *upi*. The further disposition of the *hanchi* will be discussed later.

The Third Day

The *upi*, which is now slightly bitter, is transferred to the *perol*, the large shallow pan over a fire. A thick white sediment remains in the *wirki*. This sediment, known as *upi alpi*, is further treated by adding sugar, cinnamon and some orange leaves and then boiling. It is then eaten as a delicacy in the household where the chicha is being produced.

After the *upi* has boiled for about three hours in the *perol* it is transferred to a *wirki* to cool. In Cochabamba, which is 2,572 meters above sea level, boiling occurs at 89°C. At the end of this third day the *misqui kketa* is added to the *upi*, an operation locally called *kketacha*.

The Fourth Day

The mixture of *upi* and *misqui kketa* has now begun to ferment and bubbles violently. This action soon slows down and the liquid is transferred to narrower-mouthed pots (*centaros*) at the place where the chicha will be sold or consumed (Pl. IV_D).

The Fifth to the Tenth Day

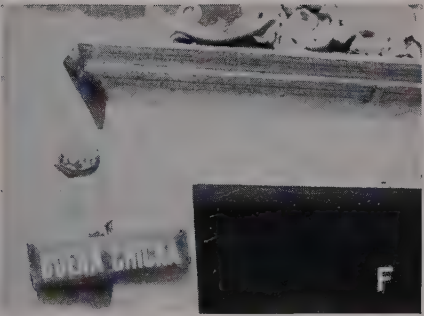
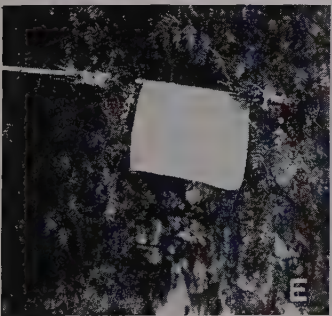
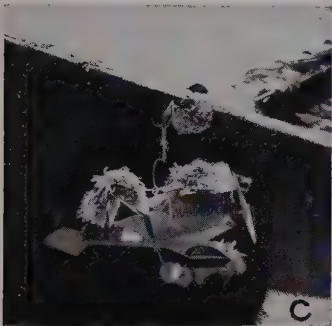
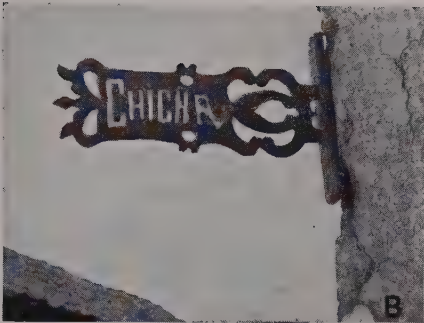
In the Cochabamba Valley, very few bubbles arise and fermentation is considered to be complete after about six days. At higher and cooler altitudes more days are needed, while in the hot lowlands less than two days may suffice.

Before the chicha is drunk, the floating froth (*aca ñahui*) is removed with the cupped hand. This froth contains oil, much yeast and some extraneous material. It is used as a sort of French polish for furniture. Occasionally

EXPLANATION OF THE ILLUSTRATION

PLATE VI. Chicha signs. A. Sacaba. B. Arani.
C. Calla-Calla. D. Cochabamba. E. Taquina. F.
Cochabamba.

PLATE VI



chicha-makers may add some of this yeasty mixture to new batches of green chicha as a starter. Usually, however, this is unnecessary because the porous earthen jars are only slightly washed out and so are normally well supplied with yeast. The jars are washed with ashes and water, swished about with a branch of molle (*Schinus Molle* L.) or *huai cha* (*Senecio clivicolus* Wedd.).

After the chicha has been drunk, a layer of sediment remains in the bottom of the pot. This sediment, the *borra de chicha*, is laid on a gunny-sack stretched over a small jar. A liquid, the *sutu*, which resembles chicha in color, but lacks the carbonated sparkle and cidery tang of good chicha, drips through the sacking. *Sutu* is greatly prized for it is reputed to have a higher alcoholic content than chicha. It is usually consumed at home, sweetened with sugar and dyed a wine-color with *airampu* (see p. 40). For each forty liters of chicha only about one liter of *sutu* is obtained. After the *sutu* is drained off, the remaining *borra* is fed to pigs and chickens, or is saved to be used in making a weak chicha to be discussed below. It may also be added to bread dough, for it provides yeast as well as filler.

At the end of the second day of chicha-making a coarse sediment, the *hanchi*, remains. This is often given to pigs and chickens, but it may also be used to make *kaima*, a cheap and weak chicha. Cold water is mixed with the *hanchi* and it is allowed to stand. After a short time a sediment settles to the bottom. The upper part of this sediment is smooth and creamy. This *kketa ordinaria*, as it is called, may be cooked with brown sugar to make a custard, or it may be added to the *misqui kketa* when it is being concentrated. If *kketa ordinaria* is added to the *misqui kketa*, more *borra* is left after the chicha has been drunk. The coarser, lower part of the sediment is fed to pigs. The supernatant liquid (*seke*) is removed and boiled

in the *perol* for two hours, then transferred to a tall pot (*cantaro*) and allowed to stand for two or three days. *Borra*, usually from a previous lot of chicha, is then added. The beverage thus produced is called *kaima*. It is consumed mainly by the Indian field laborers whose work in the hot sun makes them particularly susceptible to alcohol. They prefer *kaima* to the stronger chicha because it is possible to drink more without becoming drunk or sleepy. The sediment of the *kaima*, also called *hanchi*, is fed to pigs.

Consumption and Marketing

Well-made chicha is an attractive drink, clear and sparkling, with a flavor somewhat similar to that of apple cider. Its alcoholic content varies greatly, from about two per cent in new or in weak and watered chicha to as high as twelve per cent in a few exceptional samples. Most Cochabamba chicha has five per cent alcohol or less.

When chicha is ready for sale, a sign, the *aca llantu* ("Chicha flag") is displayed. *Llantu* is probably related to *llaitu*, the word for a fringe which denotes nobility or rulership. The frequent occurrence of fringes and tassels in chicha signs suggests that there may be some basis to the local belief that the better types of chicha were formerly reserved for the ruling class.

The simplest chicha signs are white flags attached to tall poles. These are seen only in the country districts. During fiestas the flags are decorated with flowers and colored ribbons (Pl. VI E). Some of the signs in small settlements are very ornate. Fancy tin stars, wooden condors, reed boats, cloth squares, tissue-paper frills and wooden plaques are common. Some of these are shown in Plates V and VI. In Quillacollo and Cochabamba there are laws which prohibit these fancy devices, and

most signs are simple lettered boards. These usually announce "Chicha," "Buena Chicha" (Good Chicha), "Chicha Punateña" (Chicha from Punata) or "Chicha Clizeña (Chicha from Clissa). Many *chicherias* also have a parrot in the doorway so that the illiterate may know where to drink. One *chicheria* places a single parrot in the doorway when ordinary chicha is for sale, but two parrots when the chicha is exceptionally good.

Chicha is taxed in Bolivia. Each year the right to collect these taxes is auctioned to the highest bidder. The tax is 48 Bolivian centavos (about one cent in United States money) for each bottle of 660 c.c. A bottle of chicha is usually sold for about eight United States cents. The tax is collected when the chicha is made. In Cochabamba and its suburbs, with a population of about 80,000, according to the records of the Treasury of Cochabamba, taxes were paid in 1946 by 768 licensed *chicherias* on 4,617,388 liters of chicha. It is rumored that more than twice this amount was actually made.

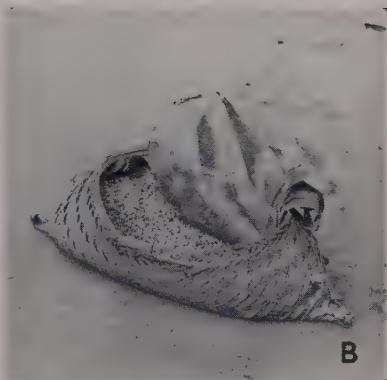
CHICHA-MAKING IN THE BOLIVIAN LOWLANDS

Chicha-making in the Bolivian lowlands is a short and simple process. Since fermentation progresses rapidly in the tropical heat, and since the natives have only a few small pots, there is neither equipment nor time for the elaborate methods which prevail in the highland valleys. Among the Takana Indians who live on both sides of the Río Beni near Rurrenabaque, chicha forms a part of the daily food of most families and nearly all homes constantly have some in preparation. Métraux (1942, p. 42) states: "None of the Takana tribes is known to have brewed any fermented drink, . . . a curious exception in an area where most tribes enjoyed several kinds of beer." We believe that fermented drinks have been known in this region for a long time, and were either

EXPLANATION OF THE ILLUSTRATION

PLATE VII. A. Grinding flour corn for chicha near Balas, Río Beni, Bolivia. B. Germinating corn grains for chicha, near Reyes, Bolivia. C. *Airampu* (*Opuntia sulphurea*). The seeds are used to dye chicha, near Cochabamba. D. Pounding grains of white flint corn for *somó* or *tuhuré*, Rurrenabaque, Bolivia.

PLATE VII



not seen or not recorded by Métraux's sources of information.⁵

Most chicha is made from the long ears of dull orange flour corn. White flint maize is seldom used. The ears are kept in the husks, tied in pairs and hung over a pole on the rafters or under the trees until needed. A pointed wooden peg held in the hand is sometimes used to facilitate the removal of the husks and grains.

The grains are soaked overnight in a jar of water, then placed in a basket lined with *Heliconia* leaves and covered with more leaves (Pl. VII B). Inside one basket the temperature was found to be 36°C. When the shoots are nearly as long as the seed (the sprouted grains are called *e bi data* in Takana), they are crushed with a rocker stone (*tumu*) on a semicircular hardwood board (*tada*) (Pl. VII A). Usually some of this ground malted grain is salivated slightly by mixing it in the mouth. The malted, ground and salivated meal (*e be teni*) is immediately placed in a jar and mixed with warm water. The mixture is then boiled for three or four hours. The boiling liquid is called *e bi data du duki*, the liquid after boiling but still hot *sina métahi*, and the liquid when cold but not fermented *hui na métahi*. After it has cooled the liquid is strained (*da kwatai*) through a piece of cotton cloth and left in a narrow-mouthed jar to ferment (*patcha chenapúi*, i.e. to become strong). Although the chicha is at its best after two days, drinking usually begins soon after the liquid cools and before it has fermented, and continues until it is gone. After five days the chicha becomes vinegar-like, but it has usually been consumed

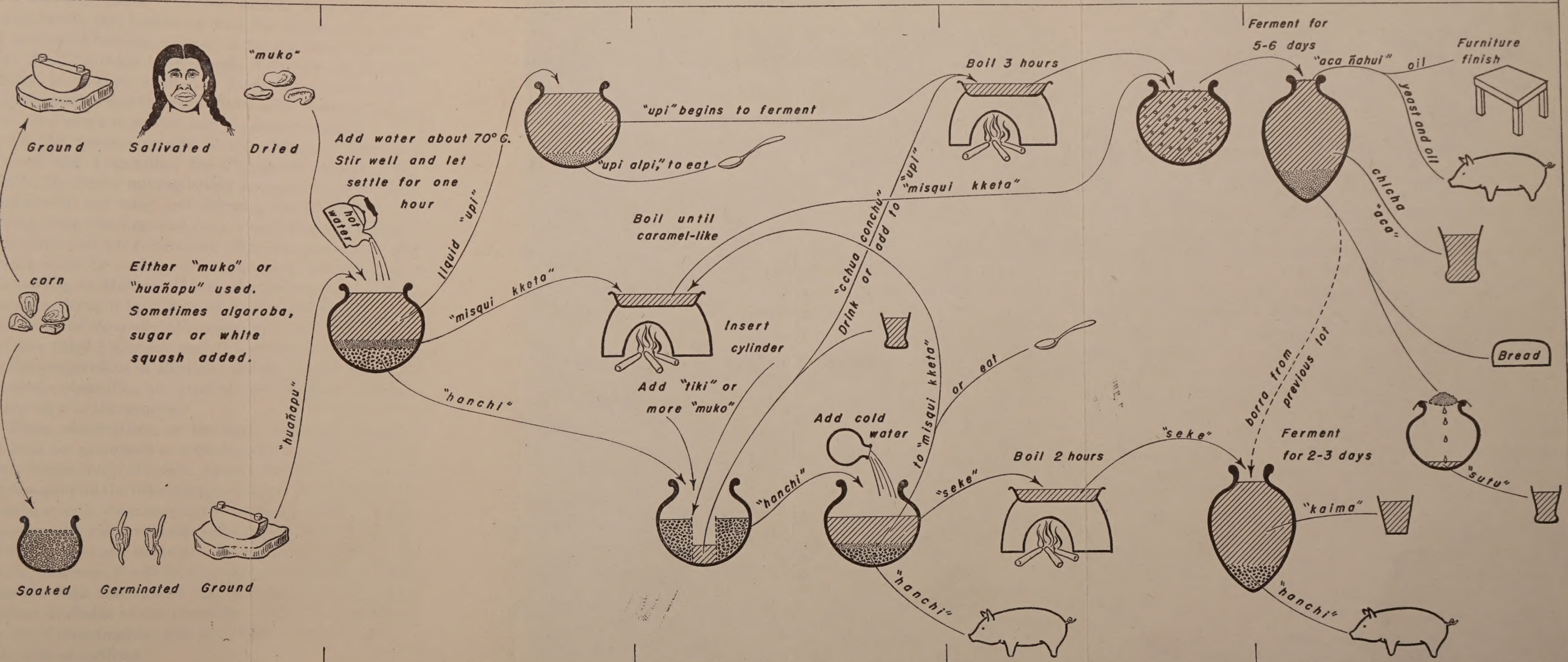
⁵ The little that is known of the Takana language is summarized by Créqui-Montfort and Rivet (1921-22). Since they list only one word for chicha (*tupari*), we are including other Takana terms recorded near Rurrenabaque. These should be accepted with caution since they were recorded by one who is not a linguist and does not speak Takana.

before this. The sediment which was left after straining and that which remains in the pot after the chicha is drunk are thrown to the pigs and chickens. There are no by-products. Just as in the highlands no yeast is added. The liquid is boiled in one pot, however, and fermented in another which is merely rinsed out after each lot of chicha has been made.

White flint corn is used to make two drinks in the Río Beni town of Rurrenabaque. The grains are pounded in a wooden mortar (*tacú*) with a pestle (*mano tacú* in the Takana dialect of Rurrenabaque) to loosen the pericarp (Pl. VII D). After winnowing, the grains are boiled in water for about three hours. Sugar is then added. When cool, this product is called *somó*, probably an introduced term. If allowed to ferment, it is called *tuhuré*.

Reference has been made to the sweet caramel-like paste (*misqui kketa*) produced in the highland chicha process. The Takana Indians prepare a similar sweet as the end-product in a process which is exactly like that for chicha up to the time of boiling. The malting, grinding and salivation have been completed and the water added. The mixture is then strained and boiled. However, instead of boiling for only a few hours, this process continues for almost a day until the liquid is sticky and caramel-like, and the Takana women judge it has reached its "point." This means that when cool it will harden just as properly made fudge does. While still hot the sticky liquid is poured or scraped onto the broad leaves of any one of several species of *Heliconia*. Usually it is eaten as a sweet (*eti hua*; in the Takana dialect spoken near Reyes, *e cua huara*). Since sugar cane is now common in the area, very few of the Takanas still make the sweet solely as a confection. It is usually utilized as an ingredient for a chicha prepared from the *bi* palm, a species of *Mauritia*.

STEPS IN THE MAKING OF CHICHA AND ITS BY-PRODUCTS IN THE COCHABAMBA VALLEY OF BOLIVIA



PRELIMINARIES

FIRST DAY

SECOND DAY

THIRD DAY

FOURTH TO TENTH DAYS

The fruits of this palm are boiled in water until the shell comes off. The mass is then worked with the hands and the corn sweet (*e ti hua*) added. This mixture is again boiled and broken up with the hands, after which it is strained through a sieve. After standing in pots for two days it is ready to be drunk. Natives claim that this chicha is stronger than that made from maize alone. Chicha made from the palm fruits alone without adding the corn sweet is weaker and is seldom prepared.

On the western margin of the Bolivian Chaco near Camiri and Lagunillas, the Chiriguano Indians make chicha by simply mixing boiled and masticated grains of maize with hot water and allowing this to ferment. In Santa Cruz, plain ground corn is sometimes mixed with hot water and left to ferment. This makes a weak chicha which must be consumed as soon as it has fermented. According to Métraux (1946), the Indians near the Pilcomayo River in the Chaco of Bolivia and Paraguay use the fruits of algarroba (*Prosopis* spp.), chanar (*Gourliea spinosa* (Mol.) Skeels), and tusca (*Acacia aroma* Gill.) in the preparation of alcoholic drinks. These fruits, particularly algarroba, are usually masticated as a preliminary step in the process.

These observations on the manufacture of chicha in Bolivia are presented as introductory material to a possible future study of native American beverages. A complete report on the manufacture and use of such beverages together with their associated ceremonies and superstitions would yield valuable information as to the spread of food plants and customs. Before such a study can be made, however, it will be necessary for the student to go into the field and collect his own data, since the information available in the literature, and even in the notebooks of ethnologists, will not suffice for more than the roughest of outlines.

LITERATURE CITED

- Acosta, José de, 1940. *Historia natural y moral de las Indias*. Mexico City.
- Cobo, Bernabé, 1890-93. *Historia del Nuevo Mundo*. Seville.
- Créqui-Montfort, G. de, and Paul Rivet, 1921-22. La famille linguistique Takana. *Journ. Soc. Amér. Paris*, n.s., 13: 91-102, 281-311, 14: 141-182.
- Cutler, H. C., 1946. Races of maize in South America. *Bot. Mus. Leaf. Harv. Univ.* 12: 257-291.
- Flornoy, Bertrand, 1945. *Voyages en Haut Amazone*. Rio de Janeiro.
- Forbes, David, 1870. On the Aymara Indians of Bolivia & Peru. *Journ. Ethnol. Soc. London*, n.s., 2: 193-305.
- Garcilaso de la Vega, 1800. *Historia general del Perú ó comentarios reales de los Incas*. Madrid.
- La Barre, Weston, 1938. Native American Beers. *Amer. Anthrop.* 40: 224-234.
- Métraux, Alfred, 1942. The native tribes of Eastern Bolivia and Western Matto Grosso. *Bur. Amer. Ethnol. Bull.* 134: 1-182.
- Métraux, Alfred, 1946. Ethnography of the Chaco, in *Handbook of South American Indians*, *Bur. Amer. Ethnol. Bull.* 143, vol. 1: 197-370.
- Métraux, Alfred, and Curt Nimuendajú, 1946. The Camacan linguistic family, in *Handbook of South American Indians*, *Bur. Amer. Ethnol. Bull.* 143, vol. 1: 547-552.
- Roquette-Pinto, E., 1938. *Rondonia*, ed. 4, Sao Paulo.
- Ruiz, Hipólito, 1931. *Relación del viaje hecho al Reyno del Perú y Chile*, Madrid.
- Zárate, Augustín de, 1853. *Historia del descubrimiento y conquista de la Provincia del Perú*. Madrid.